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Changing Chinese Perspectives on Foreign Technology: Implications for China and the West

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An Intelligence Assessment

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An Intelligence Assessment

This paper was written by
Office of East Asian Analysis. Comments and queries are welcome and may be directed to the Chief, China Division, OEA

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Changing Chinese Perspectives on Foreign Technology: Implications for China and the West

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Key Judgments

Information available as of 30 December 1986 was used in this report.

After several years of rapidly and haphazardly importing Western technology, China is reassessing the role of foreign technology in its modernization effort and shifting to greater use of domestic sources. Beijing has three main concerns:

- The decline of China's foreign exchange holdings since 1984.
- Disappointing results from using imported equipment.
- The potential harm to China's domestic industries from overreliance on imports.

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Beijing's aim is not to curb total expenditures on foreign technology, but to reduce unnecessary purchases and to increase the economic impact of the technology that must be imported. Beijing continues to view foreign technology as vital to its industrial development, its competitiveness in export markets, and its goal of eventually substituting domestic products for imports.

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Changes in the import process have been made to ensure technology purchases are essential and appropriate for Chinese factories. Beijing has, for example:

- Centralized import decisionmaking, and charged industrial ministries with checking domestic availability and ensuring imports are not redundant.
- Issued regulations linking equipment purchases to transfers of know-how, and offering preferential treatment to foreign partners that help China produce for export.
- Encouraged trade corporations and factories to seek the advice of technical consultants and to make use of feasibility studies.
- Raised tariffs and cut domestic prices to shore up sales of domestically produced goods and protect infant industries.
- Sponsored technology exhibits and fairs to make Chinese buyers aware of indigenous technologies that could substitute for foreign ones.

Improved technology use as a result of the gradual implementation of these policies will, in our judgment, strengthen a number of Chinese industries, including textiles, food processing, household appliances, consumer electronics, packaging, metallurgy, printing, and plastics. And, because Beijing is aggressively promoting exports and has tied the use of foreign technology to resultant export earnings, exports of these goods will rise significantly. To ensure that imported technology is used optimally, however, Beijing needs to improve "horizontal linkages" between factories and suppliers of

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raw materials and energy supplies, increase the number of skilled technical personnel working on assimilation problems, and provide contingency funds to importers for aftersales services. 25X1

Despite Beijing's attempts to cut back duplicate purchases, many foreign technology suppliers will find improved opportunities to sell to China during the Seventh Five-Year Plan (1986-90). Overall spending on foreign technology is slated to increase, accelerating in the latter years of the plan. The focal areas for technology import will be the energy, transport, telecommunications, raw materials processing, textile, light industry, machine-building, and electronics sectors. We also expect China to make greater use of foreign experts to conduct feasibility studies, consult on technology import needs, and provide managerial and financial advice. We believe Chinese buyers will also look for ways to acquire foreign technology without making large outlays of foreign exchange—for example, buying used equipment or the rights to dated technology processes, or leasing equipment instead of purchasing it outright. 25X1

As a result of Beijing's new policies, foreign suppliers will probably encounter additional layers of bureaucracy in the process of making a sale, prolonging negotiations. Foreign technology suppliers also will face greater pressure to engage in cooperative production projects, such as joint ventures and license agreements. The ability to provide government-backed concessional financing—already a decisive factor—will become increasingly important to foreign firms selling to China. 25X1

Beijing will continue to find Western technology—especially from Western Europe and the United States—more desirable than that from the Soviet Bloc, in our judgment. The market position of West European technology suppliers will remain strong, but will probably decline slightly from 1985 levels, which were most likely skewed by a small number of large contracts awarded to West German and French firms. We expect the US share of China's technology imports at least to stabilize—and probably to increase—over the next five years. US firms will benefit from policies linking equipment purchases to cooperative production, but will face keen competition from European firms, which often include attractive financing with their bids to supply equipment and production technology. Japan's share of China's technology purchases will probably continue to erode, as China's central trade corporations enforce Beijing's instructions to direct imports

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away from Japan—a policy first formulated in 1985 out of frustration with a ballooning bilateral trade deficit and the relatively low Japanese investment. Japanese sales figures will also begin to reflect China's suspension of imports of consumer goods production lines through 1990 and the effect of the yen's appreciation.

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We believe the Soviet Union will remain a minor source of the technology China seeks, for Beijing considers Soviet technology to be inferior. China will welcome Soviet assistance in heavy industry, however, a sector generally avoided by Western companies. Under a technical cooperation agreement signed in July 1985, China will obtain Soviet equipment and technical assistance for up to 24 projects.

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Contents

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Scope Note

This paper assesses China's changing views of the role of foreign technology in its civilian industrial modernization program, the probable outcome of policies designed to increase the impact of foreign technology while minimizing China's dependence on it, and the implications for China's economic development as well as for Western sales to China. China's growing interest in foreign technology for its military modernization program is the subject of future research.

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Changing Chinese Perspectives on Foreign Technology: Implications for China and the West

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Emerging Problems

After several years of haphazardly importing Western technology, China is reassessing the role foreign technology plays in its modernization because of concerns about the cost of that technology, how well it is being used once inside China, and its impact on domestic industries (see inset "Technology—Chinese Style").

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Excessive Expenditures of Foreign Exchange

Duplicate technology imports in 1984 and 1985, which contributed to the dramatic drop in China's foreign exchange holdings from $17 billion in December 1984 to $10.5 billion in mid-1986, have been a major concern of Chinese planning and trade officials, according to Chinese press reports. For example, China imported 113 production lines for color televisions and dozens of washing machine and refrigerator assembly lines. Similarly, the purchase of a large number of kit-assembly lines during this time committed China to massive expenditures of foreign exchange in future years as factories import the components needed for assembly. Chinese press reports acknowledge, for example, that spare parts for the television production lines alone will cost China $400 million in foreign exchange a year.

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Disappointing Results Using Foreign Technology

Several widely publicized accounts of underutilized Western technology in late 1985 and early 1986 underscored China's need to rethink its technology import strategy and procedures. Even in the nonconsumer electronics industry—a sector that receives priority funding and resource allocations—imported

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Technology—Chinese Style

Chinese statements use the term technology loosely, generally referring to both the knowledge and equipment used in production processes—separately referred to as technology software and hardware, respectively. According to a senior official from China's Ministry of Foreign Economic Relations and Trade (MOFERT), technology software encompasses patents and blueprints, proprietary information, technical and managerial training, equipment maintenance and repair services, and cooperative manufacturing arrangements. Technology hardware includes machinery as well as turnkey installations of equipment, ranging from simple mechanical items to advanced electronics equipment.

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Beijing has markedly increased imports of technology software, and reduced purchases of technology hardware during the last few years. According to MOFERT, nearly 60 percent of China's technology imports involved some form of software in 1985—up from about 50 percent in 1981. Beijing nonetheless wants to raise the percentage further; trade officials have noted that 80 percent of the technology trade of developed countries involves software.

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Technology import data in this paper are based on MOFERT statistics, except where noted, and include both software and hardware. The MOFERT statistics reflect contracts signed rather than actual shipments. Moreover, the data do not include purchases by local authorities, which, according to Chinese press reports, authorized an additional 5,000 contracts—worth $3.55 billion—in 1985. MOFERT data are the only available indicator of China's technology imports from all sources over the last eight years.

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computers, microelectronics production equipment, and instrumentation have reportedly performed far below Chinese expectations:

- In January 1986, Vice Premier Li Peng admitted that China had more than 40,000 computers in warehouses, an estimated one-fifth of the country's total at that time. Other press statements have indicated that up to three-fifths of China's computers are used only a few hours a day.[2]
- Only one of 33 imported integrated circuit production lines is in use, and it is reportedly used only sporadically.
- According to an official of the Chinese Academy of Sciences, half of the scientific instruments imported from 1981 through 1984 have not been fully utilized because of poor management and shortages of spare parts.

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China's use of imported technology is generally better in more mature industries such as shipbuilding, consumer electronics, food processing, energy, and textiles. But even in these sectors, according to Chinese press statements, the economic payoffs from introducing foreign technology have generally not matched Chinese hopes that increased export earnings would pay for individual projects within three years (see inset "Measuring the Impact of Foreign Technology").

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Stunted Development of Domestic Industries

Most recently, Beijing has voiced concern over the negative consequences for China's domestic industries of excessive imports of technologies and equipment. By creating production capacity far in excess of demand, the importation of duplicate production facilities and equipment has pushed many Chinese factories, particularly in the refrigerator and television industries, into deficits.

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Figure 1
China: Technology Imports by Central Authorities, 1979-86

[a] Dashed lines indicate projection, based on 1986 data through June.

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At the same time, imports of finished goods that China is trying to produce have made it even more difficult for Chinese factories to market their products—even those produced with foreign components or equipment.

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25X1 China's computer and microelectronics industries are depressed because burgeoning imports of finished computers and integrated circuits have made it nearly impossible for Chinese factories to market their more expensive, less well made products, while purchases of duplicate production lines have created additional surplus capacity. Most of the tens of thousands of computers and 50 million integrated circuits in warehouses in late 1985 were produced by Chinese factories.

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Measuring the Impact of Foreign Technology

Beijing probably has a poor understanding of the overall impact of foreign technology; until recently China had attempted no systematic study of technology utilization. In the last year, however, at least four separate agencies—the Ministry of Foreign Economic Relations and Trade (MOFERT), the State Economic Commission (SEC), the State Science and Technology Commission (SSTC), and the Science and Technology Leading Group (STLG)—have undertaken surveys to provide data on this question. In addition, Beijing is supplying data for a study sponsored by the Organization for Economic Cooperation and Development (OECD) of China's capacity to absorb foreign technology. For MOFERT's survey, questionnaires and investigators have been sent to all provinces and municipalities to learn the status of technology items the ministry imported during the first half of the decade. The STLG study tasks local S&T commissions to gather information on a wide range of science indicators, including the use of imported technology. The other surveys use a case study approach—with fewer examples, each in greater detail.

*Press accounts of province-by-pr*25X1*utilization of imported technology, probably resulting from the MOFERT survey, have appeared in local newspapers since mid-1986. According to the press reports, preliminary results of the survey are inconclusive—indicating that one-fourth to one-half of the items imported during the Sixth Five-Year Plan (1981-85) are installed and operating.*

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Moreover, many of the foreign-equipped production lines have not revitalized Chinese industries as expected because the newly established facilities—frequently simple assembly operations—have remained dependent on foreign components. Multiple imports of production lines also have dispersed production among small and inefficient facilities, and thereby kept China from taking advantage of economies of scale. Chinese press reports have cited the dozens of factories producing floppy disks for computers as an example of such inefficiency.

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Foreign Technology Remains Crucial

To correct these problems, Beijing aims not to curb total expenditures on foreign technology, but rather to reduce unnecessary purchases and find ways to increase the benefits from the technology it must import. Beijing still believes foreign technology, if put to good use, provides a cost-effective shortcut to the country's industrial and technological advancement. Chinese journals, for example, have cited Japanese statistics indicating that, by importing patents, blueprints, and other forms of technology software from 1950 through 1975, Japan saved 95 percent of the cost of developing the same technologies domestically. Beijing also seeks foreign technology to boost exports, and, over the longer term, to reduce China's need for imported equipment. At a national conference on the technological progress of enterprises sponsored by the State Economic Commission in late 1985, Beijing listed 12 major technologies the country would work to "digest, absorb, and shift to internal production." According to Chinese press reports, these included color televisions, ships, locomotives, numerically controlled lathes, coal-extraction equipment, and several specialized textile, metallurgical, and chemical processes.

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New Mechanisms To Regulate Technology Imports

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Beijing seeks policy solutions to its technology import problems that are less restrictive than the import legislation adopted by Brazil and India to protect their infant electronics industries from foreign competition—yet more stringent than the policies of Taiwan and South Korea, which have nearly eliminated government controls over technology acquisition to speed industrial development and export growth. Beijing has implemented a combination of direct administrative controls, economic levers, and worker and manager incentives to control the purchase and improve the use of foreign technology and to encourage greater use of domestic

Shanghai workers assemble MD-82 aircraft in a joint venture with McDonnell Douglas.

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technologies. Additional policies continue to be debated (see inset "Beijing Airs Internal Differences Over Technology Import Policies").

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As with its administration of trade in general, Beijing has sought to *strengthen central management of technology imports* to cut down on unnecessary purchases. In October 1985, Beijing implemented an approval procedure for contracts involving technology imports, under which all projects initially approved by the State Planning Commission must submit import contracts to China's Ministry of Foreign Economic Relations and Trade (MOFERT). Upon favorable review, MOFERT will issue a technology import contract license. Import contracts for less costly projects initially approved at the provincial, municipal, or

Beijing Airs Internal Differences Over Technology Import Policies

In the last year, Chinese officials have expressed a variety of opinions on the relative merits and drawbacks of foreign technology, as well as on the policies most likely to yield maximum economic benefits from foreign technology introduction. The debate centers on several issues:

- *To make or buy needed technologies.*
- *To purchase state-of-the-art or less advanced, but more easily assimilated items.*
- *To regulate imports by administrative means, or through greater use of market mechanisms.*
- *To direct purchases toward mature sectors such as textiles and machine building or to high-tech industries such as electronics.*
- *To diversify sources of supply among a greater number of countries, or to buy from only one source to ensure equipment compatibility and simplify training.*
- *To centralize import decisionmaking or to increase the factory voice in the decisionmaking process.*

These options require hard choices; many cannot be simultaneously pursued. For example, if Beijing wants to ensure greater involvement by technology users in the import process, it cannot dictate that only certain models or vendors may be selected. And if Beijing narrows the range of choices to ensure compatibility, it cannot at the same time direct business away from proven Japanese or US suppliers simply to avoid dependence on a limited number of countries.

*Sharply contrasting views on many of these issues have appeared in articles published in two prominent journals—*Red Flag, *the party theoretical journal, and* Outlook, *a publication that has frequently been a mouthpiece for China's reformers. In December 1985,* Red Flag *carried an editorial by China's Defense Minister, Zhang Aiping, that advocated strengthened central control over technology imports and assimilation, increased use of domestic technical resources, and greater attention to "suitable" technology. An editorial published in* Outlook *in May 1986, and written by the Director of the China National Technology Import-Export Corporation of MOFERT, considered greater central control a poor answer to problems with foreign technology, citing the large numbers of plants imported according to the state plan that are nonetheless underutilized. The* Outlook *editorial proposed greater use of market mechanisms throughout the economy to make factories more responsible both for their technology import choices and for their effective use of that technology upon installation. Another article in* Outlook *published in August, and written by reform theorist Huan Xiang, argued that emphasis on the development of high-tech industries was a more farsighted strategy than upgrading China's more traditional industries.*

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city level must be submitted to MOFERT's bureau at that level for license issuance (see inset "The Technology Import Process"). Beijing also has issued central directives suspending imports of production lines for color televisions, air conditioners, refrigerators, washing machines, tape recorders, and motorcycles for the entire 1986-90 period, according to press reports.

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Industrial ministries still have authority to approve some projects and to pay for technology imports using funds from retained export earnings, but Beijing has more carefully *delineated the import responsibilities of each ministry,* and spelled out procedures to guard against unnecessary purchases. For example, Beijing now requires all imports of finished microelectronic devices to go through the Ministry of Electronics; previously, such purchases have been made by local traders, or by import-export corporations under MOFERT or the Ministries of Machine-Building Industry, Astronautics, or Posts and Telecommunications. In addition, industrial ministries are responsible

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for checking domestic availability and ensuring that the proposed import would not duplicate previous purchases

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Beijing has also announced several policies designed to ensure that *transfers of know-how accompany equipment purchases,* and that technology *purchases result in additional export earnings.* In late 1984, Beijing announced that in awarding contracts for

The Technology Import Process

China's technology import decisionmaking process is extremely complex. Procedures vary according to the size, sector, and location of projects, as well as the mode of transfer (direct import, license, lease, and joint venture, for example). The process is very fluid, and has changed significantly over the last year.

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the import process is deliberately kept obscure to give the Chinese an advantage in commercial negotiations. Nonetheless,

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some generalizations may be made:

- *The State Planning Commission (SPC) must approve all imports costing more than $5 million. The SPC also approves all foreign technology purchases for projects in the annual state plan. MOFERT examines the language of technology contracts for projects provisionally approved by the SPC.*

- *Below the $5 million level, ad hoc requests must be approved by the State Economic Commission if the imported technology will be used in one of the 3,000 technical transformation projects outlined in the five-year plan.*

- *Purchases for new facilities outside the plan and below the $5 million ceiling must be approved by either MOFERT, an industrial ministry, or a provincial or municipal government, depending on which will have jurisdiction over the completed project. Most localities may only authorize imports up to $2 million in value. A few cities, however, retain authority to approve more expensive projects. Shanghai, for example, can approve purchases up to $10 million and joint ventures up to $30 million.*

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selected high-technology goods it would favor companies that set up joint ventures, compensation-trade agreements, wholly owned subsidiaries, and other arrangements for production in China. In May 1985, Beijing strengthened its demands by formally tying purchases of sophisticated foreign equipment to technical cooperation. Most recently, in October 1986, new regulations for foreign firms investing in China offered *preferential treatment to enterprises* transferring sophisticated production technologies and producing for export.[3]

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Complementing these changes at the top, Beijing has introduced measures to *improve decisionmaking at lower levels* by requiring factories and institutes to use feasibility studies and technical consultants to determine which technologies are most appropriate, and to outline the personnel, resource, and environmental prerequisites to successful assimilation of the technology.

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At the same time, to shore up sales of some domestically produced goods and thereby protect infant industries, Beijing has selectively *adjusted tariffs and domestic prices,* initially experimenting primarily in the electronics sector. For example, in mid-1985 Beijing slashed prices on domestically produced computers and integrated circuits by a third, more than doubled tariffs, and instituted a hefty surtax on imports of many of these products. In late 1986, Beijing raised tariffs on all electronic components destined for assembly in China to above 100 percent. Beijing took this step to encourage kit-assembly lines to begin producing their components in China

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Another approach taken by Beijing to encourage *greater use of indigenously developed technologies* has been the use of technology centers, exhibits, and fairs where personnel from institutes, universities, factories, and private consulting groups meet to discuss technical problems, exchange research findings, or buy and sell technology. Although such exchanges may include foreign as well as domestic participants, most of the transactions have so far involved indigenous technologies, according to Chinese press reports.[4]

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Progress Will Be Gradual

It is difficult to assess the impact of these policies because many are only in the early stages of implementation. We expect progress in any event to be slowed by the inflexible Chinese bureaucracy, which will find it difficult to coordinate across regional and ministerial boundaries. Moreover, there are basic infrastructural weaknesses in the Chinese economy that will continue to hinder technology absorption even if the new policies are successfully implemented (see inset "Infrastructural Barriers to Technology Assimilation"). Nonetheless, we believe China is on the road toward curbing unnecessary purchases and improving factory use of foreign technology.

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Fewer Unnecessary Purchases

We expect that Beijing's closer scrutiny of future technology purchases over time will substantially reduce the incidence of duplicate imports and the purchase of goods China can supply domestically, especially within ministries. Some successes are already evident. According to the Chinese press, for example, China's Ministry of Machine-Building Industry in early 1986 canceled 88 import projects that did not meet the new criteria. In addition, in our view, technology fairs and exhibits will help reduce unneeded imports by publicizing Chinese substitutes for foreign technologies. Already, Chinese press reports claim that at the first national technology fair nearly half of the factories intending to solve technical problems with foreign technology found domestic solutions.

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Infrastructural Barriers to Technology Assimilation

The vertical structure of Chinese industry *continues to make it difficult for users of imported technology to obtain needed raw materials, components, energy supplies, and trained managerial and technical personnel controlled by other ministries or by the Academy of Sciences. Calls for increased "horizontal linkages" between factories and between enterprises and research units show Beijing's awareness of the bureaucratic barriers that now exist, but Beijing continues to have difficulty implementing the concept among factories.*

Too few skilled technical personnel *are available to handle the difficult task of assimilating foreign technology. Although links to universities and research institutes are growing as a result of Beijing's encouragement of domestic trade in technology, we have no evidence that factories have hired technical consultants to work specifically on assimilation. Moreover, incentives for scientists and engineers compound the problem by rewarding them for developing new technologies and processes, but not for aiding factory assimilation of imported technology.*

Insufficient funds for the assimilation phase. *Most allocations for technology imports do not provide a cushion for maintenance or repair services, additional training, or spare parts purchases after installation. Chinese proponents of such funding changes argue that Japan spends five to seven times more to assimilate an imported technology than to acquire it initially.* [redacted]

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More Bang for the Import Buck

We believe Beijing will also gradually improve the match between imported technology and the needs and capabilities of users, boosting the economic payoffs to factories introducing foreign technology. Several factors lead us to this conclusion:

- *Better import decisions at the top.* Greater attention to the potential for successful technology assimilation when approving import projects will improve the chances for success in follow-on stages. The study sponsored by China's State Economic Commission (SEC), for example, will determine why past import projects have succeeded or failed. The SEC also is eager for the results of the study sponsored by the Organization for Economic Cooperation and Development (OECD) of Chinese technology assimilation, [redacted] and we believe the commission will make use of both studies in modifying as quickly as possible its criteria for technology import projects.

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- *Better planning at the factory level.* More experience in using feasibility studies will eventually lead to more suitable import choices as well as to adjustments in factory conditions to accommodate the imported technology. At present, Chinese feasibility studies are often incomplete or pro forma, while feasibility studies conducted by foreign consultants frequently overestimate the capabilities of a particular Chinese factory or its suppliers—or overlook complicating factors unique to the Chinese bureaucracy.[5]

- *Improved incentives for managers.* We expect Chinese managers also to become increasingly sensitive to the benefits of technology introduction—from domestic as well as foreign sources—and the costs of poor technology utilization.[6] Managerial incentives and authority should improve as Beijing extends both the "factory manager responsibility system" and the limited bankruptcy legislation it announced in late 1986, and adopts—as we expect—additional wage and price reforms as well as a national unemployment insurance program. These

[5] One major Sino-US joint venture, the Beijing Jeep Company, for example, produced a feasibility study outlining the models and quantities of vehicles to be produced. As planned, according to Embassy reporting, the venture would have been financially viable; in practice, however, China encountered numerous technical difficulties. The foreign exchange problems that ensued when the venture began to assemble a different model Jeep—using imported rather than domestic components—made front page headlines in both countries. [redacted]

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changes will make determinations of factory profitability, productivity, and efficiency more accurate, and also give factory managers more authority over production decisions and more freedom to fire workers displaced by technological improvements.

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Boosting Industrial Performance

In our judgment, the trend toward technology imports that are better suited to the country's needs—accompanied by improvements in China's technical and managerial work force and the adoption of economic policies that reward effective technology use—will gradually increase the positive impact of foreign technology on Chinese industry. We believe the sectors that will be most strengthened are the ones that have already demonstrated an ability to improve output and product quality through Western equipment and technology; according to China's leading economic newspaper, these include the *textile, food processing, household appliance,* and *packaging* industries. We believe several other sectors are likely to make fairly rapid strides. According to consular reporting, for example, Shanghai has used foreign technology with moderate to good success in *metallurgy, printing,* and *plastics*. Survey results for Jiangsu Province show above-average results in the *consumer electronics* sector. In that sector, foreign technology has resulted in production and export gains in more than 40 percent of the projects—not as good as the 50-percent success rate in textiles, but considerably better than the results in the machinery and chemical industries.

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Because China is directing a large amount of resources—financial, material, and personnel—to the development of its consumer electronics industry, we expect progress to be especially rapid in this sector. Shanghai has reported a ninefold increase in television production between 1980 and 1985; Guangdong Province claims to have boosted electronics production at an average annual rate of 54 percent over the last five years—both primarily through foreign technology introduction. Most of the increased output reported in Shanghai and Guangdong is directly attributable to the use of imported components, however, and future gains will be slowed by Chinese restrictions on the import of components. Chinese factories continue to have difficulty producing integrated circuits, television picture tubes, and many other components.

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In these sectors, because Beijing is aggressively promoting exports—and has tied the use of foreign technology to the promise of export earnings, rather than solely to improved production for the domestic market—we expect Chinese goods to compete increasingly in international markets. Foreign technology will help China produce goods that approach international standards, improve quality control, and upgrade packaging. This effect is already apparent in the textile sector; for example, 70 percent of Jiangsu's increased textile export earnings over the last five years are directly attributable to foreign technological upgrading, according to provincial press reports. We believe Chinese exports of appliances, consumer electronics items, processed foods, plastics, and toys will also jump significantly in the next few years.

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Consequences for Technology Suppliers

Short-Term Growth in Selected Areas

Although individual suppliers—who in the past have made multiple sales of similar technology—will find sales opportunities decreasing as Beijing curbs duplicate purchases, in many sectors foreign technology suppliers will find improved opportunities to sell to China during the Seventh Five-Year Plan (1986-90). Overall spending on foreign technology is slated to increase, according to the plan.

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China's foreign exchange budget for the technical transformation of antiquated Chinese enterprises is 10 percent higher for 1985 through 1987 than during the preceding three-year period. We believe that purchases during the latter years of the decade will be even higher.

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According to MOFERT, the focal areas for technology import will be the energy, transport, telecommunications, raw materials processing, textile, light industry, machine-building, and electronics sectors. The Chinese press also has prominently carried articles calling for increased imports of "brainpower," and we expect China to make greater use of foreign experts to conduct feasibility studies, consult on technology import needs and assimilation barriers, and provide managerial and financial advice to factories.[8] Increasing numbers of foreign scientists also will be invited to participate in research conducted in Chinese institutes, many of which have been opened to foreigners only in the last year. And Beijing intends to send more students, managers, and workers abroad for technical and managerial training and education.[9]

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We believe that over the next few years Chinese buyers will also look for ways to acquire Western equipment and technology without large outlays of foreign currency—for example, by buying used equipment or the rights to dated technology processes, or by leasing equipment instead of purchasing it outright:

- China hosted its first international secondhand equipment exhibition in late 1985—the first ever held in a country interested in buying, rather than selling, used equipment. Although few contracts were signed during the trade fair, Western news reports have indicated that the Chinese were ready to buy; the low sales figures largely reflect problems on the part of suppliers—who apparently regarded the exhibit as an opportunity to make preliminary contacts, rather than actual sales. We believe that future exhibits, already scheduled, will be more successful as exhibitors gain experience in this type of forum.

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- Equipment leasing is a growing business. China reportedly imported equipment worth more than $500 million under leasing arrangements in 1984—a figure one Chinese leasing company manager expects at least to double by 1990. The leading party journal, *Red Flag*, has advocated leasing to keep up with technological innovations, while avoiding heavy investments in sectors where technology is evolving rapidly; leases usually are written for a several-year period, and annual rental fees generally are only 10 to 20 percent of the cost of the equipment, with the first payment delayed until six months after the equipment is installed. The journal also pointed out the advantage of leasing to avoid restrictive US or multilateral export controls, because actual ownership of equipment remains in the hands of the foreign supplier. For factory managers, leasing is also an attractive way of avoiding some of the headaches of the technology import process; leases normally can be approved by provincial authorities.

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But More Headaches Dealing With the Chinese Bureaucracy

Although sales prospects remain generally good for foreign technology suppliers in the next few years, we believe foreign firms will often have to work harder, and wait longer, for such sales to materialize:

- While policies regulating technology purchases are in a state of flux, confusion will be even more pronounced than at present. Western businessmen have reported a number of broken or renegotiated contracts because the recentralization of control over imports has forced changes in negotiating entities and personnel.

- Foreign firms will encounter additional layers of bureaucracy in the process of making a technology sale, prolonging negotiations as a result of greater centralization of technology import decisionmaking.

[8] China's official news agency has reported that in the last two years 10,000 foreign experts have supervised the use of imported equipment in China.

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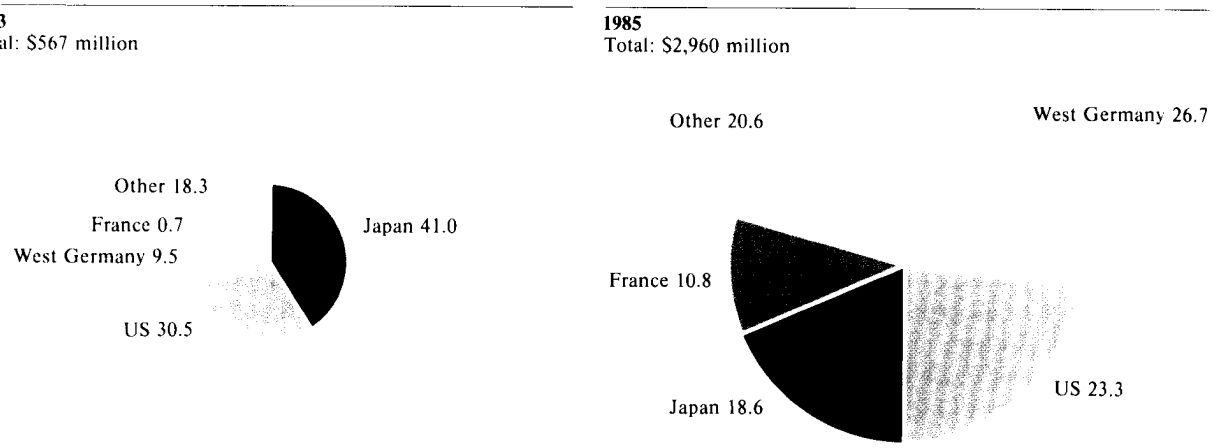
Figure 2
Sources of China's Technology Imports, 1983 and 1985[a]



[a] MOFERT statistics include technology "software" and "hardware." Data reflect the value of contracts signed, but not necessarily delivered. No breakdown is available of technology imports approved by independent or locally based Chinese traders—which purchased a majority of the technology imported in 1985.

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China's Regulations for the Administration of Technology Import Contracts, issued in May 1985, purport to set some limits on the process; within 30 days of the initial signing, contracts must be submitted to higher authorities, who must approve or deny them within another 60 days. Unfortunately, the regulations do not set limits on the time leading up to initial contract signing, and the 30- and 60-day limits are unenforceable.

- Equipment suppliers will face greater pressure to engage in cooperative production projects such as joint ventures and license agreements. The ability to provide government-backed concessional financing or attractive suppliers' credits—already a decisive factor in many decisions to award contracts—will become increasingly important to foreign firms trying to sell China technology and capital equipment.

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US and West European Sales Crowd Out Japanese and Soviet Suppliers

We believe that in nearly all sectors Beijing will continue to find Western technology—especially from the United States and Western Europe—more desirable than that from the Soviet Bloc. We believe the market position of West European technology suppliers will remain strong, but will probably decline slightly from 1985 levels. In the last few years, Western Europe has picked up market share rapidly; in 1985, according to MOFERT data, West Germany became China's leading technology supplier (see figure 2). We think the 1985 data are exceptional, however, because a few large contracts awarded to West German and French firms probably skew the figures for that year.

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US technology remains a top priority in China's foreign trade, according to statements from high-ranking Chinese officials. Although the US share of China's technology imports has dropped as West European sales have climbed, we expect the US share at least to stabilize—and probably to increase—over the next five years. US firms will probably benefit from Chinese policies linking purchases to cooperative production, displacing some potential suppliers who are more reluctant to transfer production know-how, although the short-term marketing advantages US firms gain by transferring production technology will eventually help Chinese factories achieve their strategic goal of substituting domestic products for imports. In our judgment, US firms will feel some of the pinch resulting from Beijing's greater selectivity in importing technology, but much less than Japanese companies. US companies will face keener competition from European competitors, however, who often include attractive government-backed financing packages with their bids to supply equipment and production technology.

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We believe Japan's share of China's technology imports will continue to drop. Japan's share of foreign technology purchases authorized by China's central trade corporations has declined markedly in recent years as imports have shifted toward more software or know-how, which Beijing considers Tokyo reluctant to share. Another factor in the decline was probably Beijing's early 1985 instruction to Chinese importers to direct trade away from Japan, a policy it reaffirmed in mid-1986 out of frustration with a ballooning bilateral trade deficit and the relatively low level of Japanese investment.[10] We believe Beijing will continue to have difficulty enforcing the directive outside the central trading apparatus, where favorable Japanese prices, financing packages, and a ubiquitous sales presence often win contracts—despite the appreciation of the Japanese yen. Even so, we expect Japan's share of China's technology imports to decline as central trade corporations increase their control over purchases of foreign technology. China's 1985 suspension for the next five years of imports of consumer goods production lines, most of which came from Japan, will also contribute to a drop in Japan's share of China's technology imports through 1990.

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We believe the Soviet Union will remain a minor source for the technology China seeks from abroad. Embassy reporting indicate that Beijing considers Soviet technology inferior, and—in many cases—no easier than Western technology for China to assimilate; present-day Soviet technology is often incompatible with the Western equipment introduced in recent years. Nonetheless, China will probably welcome Soviet assistance in heavy industry, a sector that Chinese officials claim Western investors avoid. Under a technical cooperation agreement signed in July 1985, China will obtain Soviet equipment and technical assistance for up to 24 projects; according to a Soviet official in Beijing, these include projects related to power generation and transmission, metallurgy, coal mining and processing, chemicals, textiles, and transportation.

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